

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-9 are presently active in this case. The present Amendment amends Claims 1-4 and adds new Claims 5-9 without introducing any new matter.

The outstanding Office Action objected to the Specification and Claims 1-4 because of informalities. Claims 2 and 3 were rejected under 35 U.S.C. §112, second paragraph, as indefinite. Claims 1 and 4 were rejected under 35 U.S.C. §102(b) as anticipated by Ichikawa (U.S. Patent No. 6,333,665). Claims 1 and 4 were also rejected under 35 U.S.C. §102(e) as anticipated by Klein et al. (U.S. Patent No. 6,756,826, herein "Klein").

Claims 2 and 3 were indicated as allowable if rewritten in independent form. Applicant acknowledges with appreciation the indication of allowable subject matter. However, since Applicant considers that independent Claim 1, from which Claims 2-3 depend, defines patentable subject matter, dependent Claims 2-3 are maintained in dependent form at the present time.

In response to the objections to the Specification, the Specification is amended to correct "MOD-type" to "MOS-type." In light of the formal nature of this correction, the change to the Specification does not raise a question of new matter.

In response to the rejection under 35 U.S.C. §112, second paragraph, Claims 1-3 are amended to correct the noted informalities. Specifically, Claim 1 is amended to recite "a first switch configured to supply a gate current during a first turn-on operation." Claim 2 is amended to recite "wherein the first and third switches form a first gate turn-on circuit." Claim 3 is amended to recite "said MOS-type device which is turned on after the first turn-on operation." In view of amended Claims 1-3, it is believed that all pending claims are definite and no further rejection on that basis is anticipated. If, however, the Examiner disagrees, the

Examiner is invited to telephone the undersigned who will be happy to work with the Examiner in a joint effort to derive mutually acceptable language. Further, Claims 1-4 are amended to correct minor informalities and to better comply with U.S. claim drafting practice. Since the amendments to Claims 1-4 are only formal in nature, they are not believed to raise any question on new matter.

In order to vary the scope of protection recited in the claims, new Claims 5-9 are added. New Claim 5 depends upon Claim 1 and recites "said third switch is connected in parallel to a first constant current device."¹ New Claim 6 depends upon Claim 1 and recites "said first and third switch are connected in series."² New Claim 7 depends upon Claim 1 and recites features regarding the second and fourth switch.³ New Claim 8 depends upon Claim 1 and recites "the second switch is connected between the gate and an emitter of the MOS-type device through a second constant current device, and the fourth switch is connected between the gate and the emitter of the MOS-type device through a third constant current device."⁴ New Claim 9 depends upon Claim 2 and recites "said first and second gate turn-on circuits are connected between a power supply voltage and the gate of said MOS-type device."⁵ Since the new claims find non-limiting support in the Disclosure as originally filed, they are not believed to raise a question of new matter.⁶

In response to the rejections of Claims 1 and 4 under 35 U.S.C. §102(b) and 35 U.S.C. §102(e), Applicant respectfully requests reconsideration of these rejections and traverses the rejections, as discussed next.

Briefly recapitulating, Applicant's invention, as recited in Claim 1, relates to a semiconductor apparatus including a MOS-type device, including a first switch configured to

¹ Finds non-limiting support in Applicant's Specification at page 5, lines 3-4 and in corresponding Figure 1.

² Id. at page 5, lines 1-2 and in corresponding Figure 1.

³ Id. at page 5, lines 5-9 and in corresponding Figure 1.

⁴ Id. at page 5, lines 5-9.

⁵ Id. at page 8, lines 1-6 and in corresponding Figure 3.

⁶ See MPEP 2163.06 stating that "information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

supply a gate current during a first turn-on operation for turning on the MOS-type device; a second switch configured to discharge a gate capacitance during a turn-off operation for turning off the MOS-type device; a third switch configured to increase the gate current; and a fourth switch configured to increase the discharge current during the turn-off operation of the MOS-type device, wherein a first timer is configured to turn on the third switch in conjunction with the turn on of the first switch and further is configured to turn off the third switch after a first predetermined time from the turn on of the third switch.

As explained in Applicant's Specification at page 3, lines 8-11 with corresponding Figure 2, Applicant's invention improves upon conventional apparatuses including a MOS-type device because such MOS-type devices can be turned-on and turned-off with a relatively simple configuration by improving response and efficiency, and further by reducing EMI noise and switching loss of the MOS-type device.

Turning now to the 35 U.S.C. §102(b) rejection, the Ichikawa patent discloses a gate driving method that improves high-frequency operation of insulated gate semiconductor devices (IGBT), by using P-channel and N-channel semiconductor devices connected in series (totem pole connection).⁷ However, Ichikawa fails to teach a timer configured to turn on the third switch in conjunction with the turn on of the first switch. On the contrary, Ichikawa explicitly shows in Figure 5 that none of the first to fourth switches 12, 13, 15 and 16 are turned on in conjunction,⁸ but they are turned on at different time instants t_0 , t_2 , t_3 and t_5 . Further, the configuration of the semiconductor devices 12, 13, 15 and 16 would not permit the switches 12 and 13 or 15 and 16, respectively to be turned on in conjunction, since these switches are connected in series between two power sources P and N.⁹ Ichikawa also discloses that at a time t_1 the IGBT 10 is turned on and at a time t_2 (for instance $10\mu s$ after t_1)

⁷ See Ichakawa at column 2, lines 27-38.

⁸ See Ichakawa in Figure 4 and 5.

⁹ See Ichawaka at column 3, lines 50-55 and in corresponding Figure 3.

the switching device 15 is turned on.¹⁰ Accordingly, a switching device turned on at a time t_2 after a time t_1 , as taught by Ichikawa, *is not* a first timer configured to turn on the third switch in conjunction with the turn-on of the first switch, as claimed by Applicant.

Turning now to the 35 U.S.C. §102(e) rejection, the Klein patent discloses a buffer circuit and a process for driving an output signal for a gate of a MOS transistor to produce slow edges at the buffer's output.¹¹ However, Klein fails to teach a timer that is configured to turn on the third switch in conjunction with the turn on of the first switch, and turn off the third switch after a first predetermined time from the turn on of said third switch. On the contrary, Klein explicitly teaches that timed output of one shot circuits activate switches to control the buffer.¹² Further, since Klein's input signal from the one shot element 52 drives the gates of PMOS 64 and PMOS 56,¹³ there is no timer that can turn-off the third switch after a first predetermined time from the turn-on of said third switch. Klein is silent on at what time the switches 56 and 64 are turned off. Accordingly, a one shot element turning on MOS-transistors at the same time, as taught by Klein, is not a timer is configured to turn off the third switch after a first predetermined time from the turn-on of said third switch, as claimed by Applicant.

Therefore, the applied references fail to teach or suggest every feature recited in Applicant's claims, so that Claims 1 and 4 are believed to be patentably distinct over these references. Further, Applicant's new dependent Claims 5-9 recite features neither taught nor suggested in both references Ichikawa and Klein. Therefore, Applicant respectfully traverses, and requests reconsideration of, the rejections based on Ichikawa and Klein.¹⁴

¹⁰ See Ichikawa from column 3, line 64 to column 4, line 13 and in corresponding Figure 4.

¹¹ See Klein at column 2, lines 20-27.

¹² See Klein at column 2, lines 33-35.

¹³ See Klein at column 4, lines 2-10.

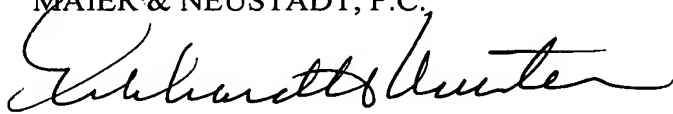
¹⁴ See MPEP 2131: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference," (Citations omitted) (emphasis added). See also MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-9 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicant's undersigned representative at the below listed telephone number.

Respectfully submitted,

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